DIASTEREA, A NEW GENUS OF FLOWER SPIDER (THOMISIDAE: THOMISINAE) FROM EASTERN AUSTRALIA AND A DESCRIPTION OF THE MALE *DIASTEREA LACTEA*

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A new thomisid spider genus *Diasterea* is defined. *Diaea lactea* (L. Koch) is transferred to *Diasterea* and *Diaea albiceris* (L. Koch) is synonomised with *Diasterea lactea*. The female of *D. lactea* is redescribed, the male is described for the first time, notes on the biology are given and the known range is extended from Queensland and New South Wales into Victoria.

AUSTRALIAN species of '*Diaea*' are considered by Lehtinen (1993) to be distinct from the American *Misumenops* and Eurasian *Diaea*. He considers that *Misumenops* and closely related genera are Neotropical in origin. The *Misumenops* group extends to Japan in the north and Hawaii in the mid Pacific, and their range does not overlap with the Australian '*Diaea*' which extends from Australia through Melanesia into West Polynesia (Lehtinen 1993). Lehtinen (1993) considers that at least some Australian–Polynesian '*Diaea*' deserve generic status.

Misumena lactea was originally described by L. Koch (1876), based on a female specimen from Sydney, NSW, now lodged in the Zoologisches Institut und Museum, Hamburg (Raek 1961). *M. albiceris* was also described by L. Koch in the same publication, based on a female from Peak Downs in Queensland. According to Raek (1961) this specimen has been lost, but the Museum has a female from Sydney. Mascord (1970) states that *D. albiceris* is widespread in the Sydney region, but is not common. *D. albiceris* has also been reported from Norfolk Island (Rainbow 1920).

Mascord's (1970, 1980) photographs of two females labelled *D. albiceris* suggest that there is considerable variation in the dorsal pattern of these spiders.

Specimens of *D. lactea* were collected (J. Strudwick) from a native plant garden set in a regrowth woodland dominated by *Eucalyptus polyanthemos* (red box), *E. goniocalyx* (long-leaf box) and *E. macrorhyncha* (stringybark) at Upper Lurg, south-east of Benalla, Victoria, Australia. Biological observations were made by J. Strudwick.

Chaetotaxy was described according to Schick (1965) and leg spination formulae according to Platnick & Shadab (1975) except that pairs of setae are indicated separately, linked by +.

All measurements are given in mm.

Abbreviations used

Collectors: May Bennie (MB), Valerie Davies (VED), Julie Strudwick (JS).

Specimen locations: Zoologisches Institut und Museum, Hamburg (ZIMH), Queensland Museum (QM), Museum Victoria (MV), Central Victoria Regional Insect Collection (CVRIC) housed at La Trobe University, Bendigo.

Measurements: cephalothorax length (CL) and width (CW), abdomen length (AL) and width (AW), median ocular quadrangle (MOQ).

Eyes: anterior median (AME), anterior lateral (ALE), posterior median (PME), posterior lateral (PLE).

Spinnerets: anterior (ALS), median (PMS), posterior (PLS).

Legs: dorsal (D), ventral (V), prolateral (P).

SYSTEMATICS

Family THOMISIDAE Sundevall, 1833

Subfamily Thomisinae Sundevall, 1833

Diasterea gen. nov.

Type species. *Misumena lactea* L. Koch 1876.

Description. Medium sized thomisids; male much smaller than female. Cephalothorax as long as wide with setae. Lateral eyes on a single large protuberance, eyes subequal, AME Æ ALE Æ PLE Æ PME, MOQ wider than long, wider behind than in front. Sternum longer than wide, chelicerae with two small promarginal teeth, labium longer than wide. Leg formula 1243. Legs with spines. Male palp with small VTA, large RTA with prominent dorsal tip. Tegulum simple with a small (posterior) apophysis near the proximal edge. Epigynum without hood.

Diagnosis. *Diasterea* can be differentiated from Thomisus by the rounded shape of the lateral eye protuberance, presence of setae on the cephalothorax, and presence of two promarginal chelicerai teeth; from *Diaea* by the presence a common lateral eye protuberance (in *Diaea* the lateral eyes are on individual small tubercles), the absence of a hood in the female epigynum and the male much smaller than the female; from *Misumenops* by the absence of an epigynal hood; and from Australian '*Diaea*' by the presence of the lateral eye protuberance, and the male much smaller than the female.

Etymology. '*Diasterea*' is formed from *Diaea* and Asteraceae, the daisy plant family. The type species frequently forages on daisy flowers.

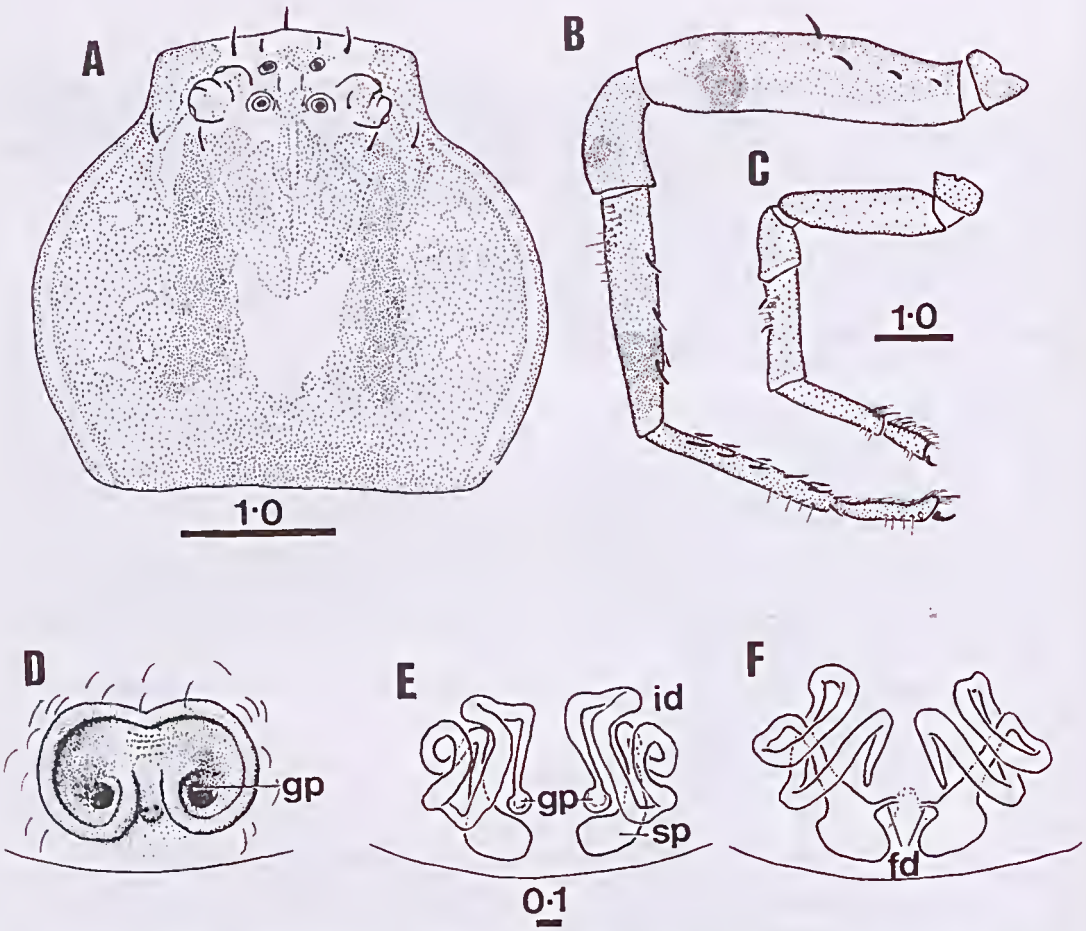


Fig. 1. A–F, *Diasterea lactea*, female. A, carapace. B, C, legs, retrolateral: B, leg 1; C, leg 4. D, epigyne. E, F, internal genitalia. Scale bar represents 0.1 mm in each case. fd = fertilisation duct, id = insemination duct, gp = gonopore, sp = spermatheca.

Diasterea lactea (L. Koch, 1876)

Figs 1–7

Misumena lactea L. Koch 1876: 799, pl. 69, figs 5, 5a, Sydney, New South Wales.
Diaea lactea (L. Koch, 1876). Rainbow 1911: 216.
Misumena albiceris L. Koch, 1876: 801, pl. 69, figs 6, 6a, Peak Downs, Queensland.
Diaea albiceris (L. Koch, 1876). Rainbow 1911: 216.

Types. Holotype female *Misumena lactea* from Sydney, NSW, in ZIMH (examined).

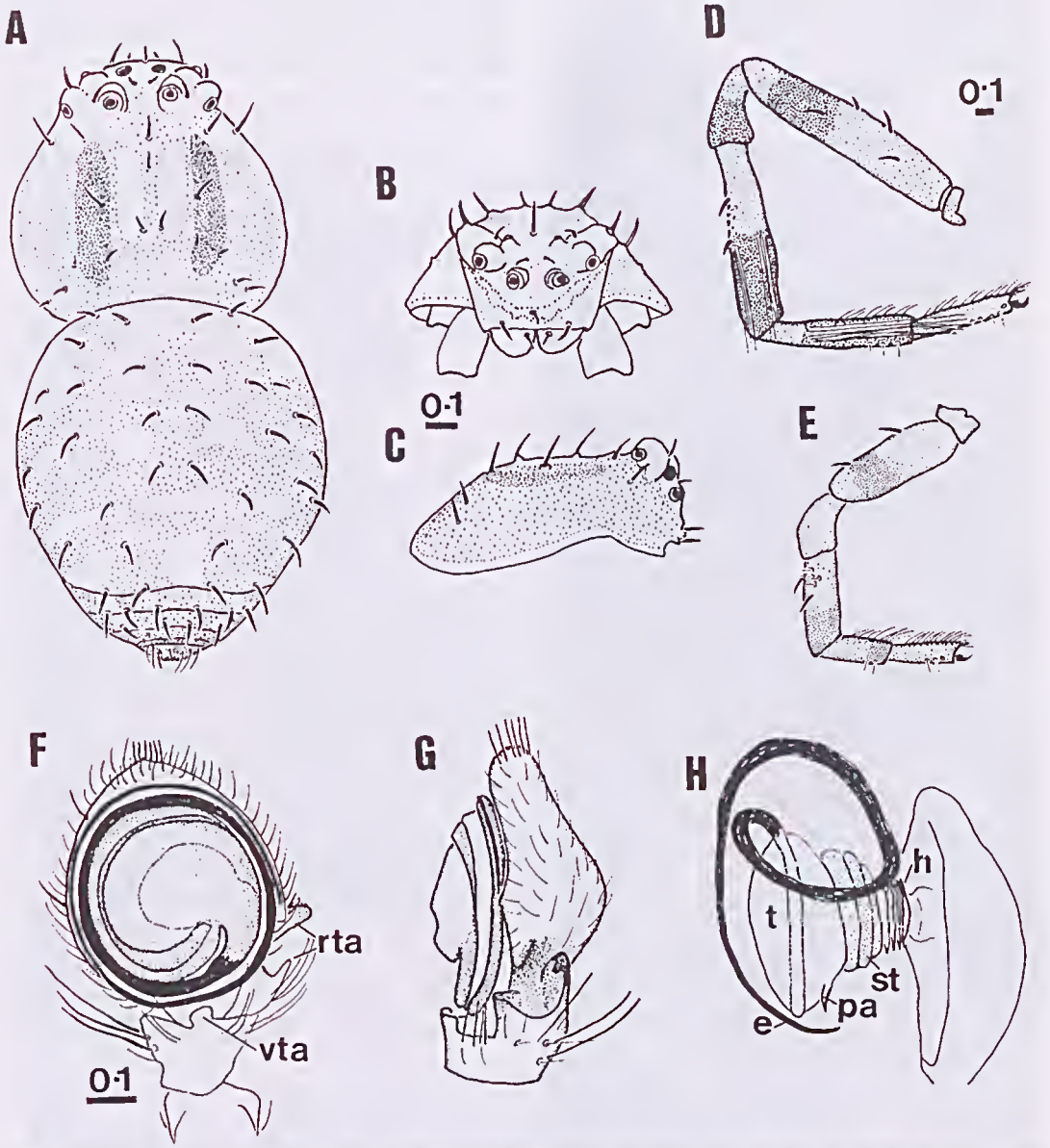


Fig. 2. *Diasterea lactea*, male. A, dorsal view of body. B–C, carapace. B, frontal view. C, lateral view. D, left leg 1. E, left leg 4. F–H, left palp. F, ventral. G, lateral. H, lateral, expanded. Scale bar represents 0.1 mm in each case. e = embolus, h = haematodocha, pa = posterior tegular apophysis, rta = retrolateral tibial apophysis, st = subtegulum, t = tegulum, vta = ventral tibial apophysis.

Fig. 3. Diasterea lactea. A, male, dorsal. B, female, dorsal, showing legs 1 and 2 of the same male as A. C, same female and male in mating position, posterior. (Photos by J. Strudwick.)

Other material examined

Victoria: Upper Lurg: 1 male, 1 female, 29.xii.1992, JS, S30573 QM; 1 female, 29.xii.1992, JS, S30574 QM; 1 female, egg sac, 2.i.1993, JS, K3914, MV; 1 female, egg sac, 2.i.1993, JS, JSt5 CVRIC; 1 female, 1 egg sac, 17.i.1993, JS, S30575 QM; 1 female, egg sac, 17 juveniles, 21.i.1993, JS, S30576 QM; 1 male, 1 female, 23.i.1993, JS, S30577 QM; 1 male, 21.xi.1994, JS, S30578 QM; 1 male, 8.xii.1994, JS, JSt156 CVRIC; 1 male, 9.xii.1994, JS, JSt157 CVRIC; 1 male, 17.ii.1995, JS, JSt250 CVRIC; 1 male, 17.ii.1995, JS, K3913 MV; Swan Hill: 1 female, 5.xi.1986, G. Kenna, K3896 MV; Wilkur: 1 female, 18.xi.1955, W. Spuerell, K3898 MV; Bendigo: 1 female, 10.xii.1961, M. Cohn, K3897 MV.

New South Wales: Koraleigh: 4 females, retreat, xi.1988, D. Ashurst, K3899 MV; Sydney: 1 female *Misumena albiceris*, Godeffroy Museum No. 14626, ZIMH; Tubrabucea: 1 juvenile, 22.i.1948, R.J.M.P. & A.N.B., K3901 MV.

Queensland: Lake Broadwater: 1 female, 21.xii.1984, MB, S30580 QM; 1 female, 25.ii.1986, VED, S30579 QM.

Female. QM S30573
(Figs 1, 3B–C, 4A–D, 5A–F)

CL 3.0, CW 3.1, AL 4.6, AW 4.7. Carapace (Fig. 1A) light brown with white markings, white eye tubercles, erect setiform setae on anterior region. Ocular region raised, lateral eyes on large lateral protuberance, PLE on side of protuberance directed laterally and the ALE on front of protuberance directed anteriorly, PME on small tubercles, AME not on tubercles, eyes subequal, AME Æ ALE Æ PLE Æ PME; ALE 0.10, AME 0.12, PLE 0.10, PME 0.09, MOA wider than long, wider behind than in front, PLE–PME Æ PME–PME. Two cheliceral teeth and five long cheliceral setae on promargin of the fang furrow (Fig. 4A), each chelicera has one frontal seta. Clypeus vertical, wider than AME–AME. Chaetotaxy: A2, C3, P1, P3, P4, S1.

Legs (Figs 1B–C, 4C–D) 1243. Measurements: see Table 1. Legs light brown with white markings

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
			Female			
1	4.0	1.6	2.9	2.7	1.2	12.4
2	4.0	1.6	3.0	2.5	1.1	12.2
3	1.9	0.9	1.1	1.0	0.6	5.5
4	2.0	1.0	1.4	1.1	0.6	6.1
			Male			
1	1.5	0.6	1.2	1.0	0.6	4.9
2	1.5	0.6	1.2	0.9	0.6	4.8
3	0.8	0.4	0.6	0.4	0.3	2.4
4	0.8	0.4	0.6	0.4	0.3	2.5

Table 1. Leg measurements.

and dark brown bands; spines: 1: femur D1–0–0, P2–1–0; tibia D1–1–0, V1–0–2, metatarsus P0–0–1, V2+2–2+2–2+2; 2: femur D1–0–0, tibia D1–0–0, V2+2+2–1+2–2+2; metatarsis P0–0–1, V2+2+2–1+2–2+2; 3: D1–1–0: 4: tibia D1–1–0. Tarsal claws (Fig. 4C): 1: anterior claw with 5 larger and 3 smaller teeth, posterior with 5 larger and 5 smaller teeth; 2: anterior claw with 5 larger and 2 smaller teeth, posterior claw with 7 larger and 2 smaller teeth; 3: anterior claw with 3 larger and 2 smaller teeth, posterior claw with 4 larger and 2 smaller teeth; 4: anterior claw with 3 larger and 1 smaller teeth, posterior claw with 4 larger and 1 smaller teeth. Claw tufts sparse. Scopula on distal third of metatarsus and tarsus, sparse on legs 1 and 2, well developed on legs 3 and 4. Trichobothria (Fig. 4C–D): 1: proximal group of 12 (prolateral group of 8 and lateral group of 4) on tibia, distal row of 4 on metatarsus, distal row of 4 on tarsus; 2: proximal group of 13 on tibia, distal row of 4 on metatarsus, distal row of 5 on tarsus; 3: proximal group of 13 on tibia, distal row

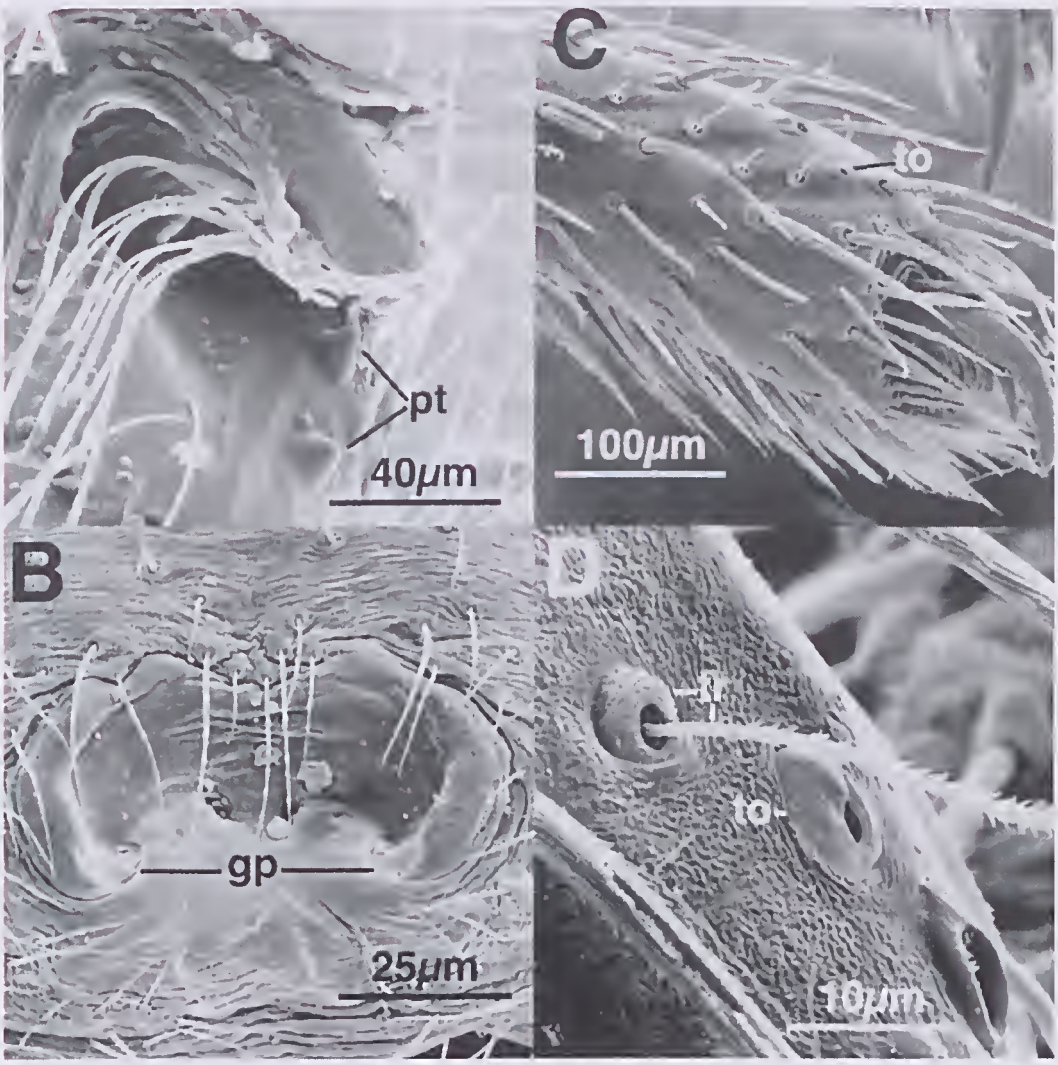


Fig. 4. Diasterea lactea, female. A, right cheliceral fang and groove with two promarginal teeth. B, Epigyne. C–D, right leg. C, tarsus 3 with tarsal organ and trichobothria. D, distal trichobothrium and tarsal organ. gp = gonopore, pt = promarginal cheliceral tooth, to = tarsal organ, tr = trichobothrium.

of 3 on metatarsus, distal row of 3 on tarsus; 4: proximal group of 15 on tibia, distal row of 3 on metatarsus, distal row of 3 on tarsus. Tarsal organ (Fig. 4C–D) slightly larger than the base of the tarsal trichobothria.

Sternum white, longer than wide, heart shaped, labium longer than wide, clavate branched hairs on and around mouthparts.

Abdomen white with light brown patches, somewhat pyriform in shape, with sparse short hairs. Spinnerets (Fig. 5): two major ampulate gland spigots and approximately 38 piriform gland spigots on ALS (Fig. 5B–D), 1 minor ampullate gland spigot, 1 ?cylindrical gland spigot and approximately 30 aciniform gland spigots on PMS (Fig. 5E), approximately 53 aciniform gland spigots on PLS (Fig. 5F).

Epigynum (Figs 1D–F, 4B) with deep fossa bearing two small pits near mid posterior margin, gonopores sclerotised posteriorly, insemination ducts long and winding in approximately 2 non-spiral loops, diameter of the ducts enlarged at the first dorsal loop, spermatheca slightly twisted, spermathecal organ absent.

Male. QM S30577
(Figs 2, 3A, 6A–F, 7A–D)

CL 1.2, CW 1.2, AL 1.5, AW 1.2. Approximately one-third the body length of the female. Carapace (Figs 2A–C, 6A) colouring similar to female, with similar eye tubercles to female, eyes subequal, AME Æ ALE Æ PLE Æ PME; ALE 0.08, AME 0.08, PLE 0.08, PME 0.06, PLE–PME Æ PME–PME. MOQ wider than long, wider behind than in front. Chelicerae (Fig. 6B–C): two teeth and five long setae at anterior margin of cheliceral furrow; each chelicera has one anterior seta. Clypeus vertical and wider than AME–AME. Erect setaeform setae not confined to anterior region. Chaetotaxy: A2, C1 (tiny), C3, C5, P1, P3, P4, S1, S6, S7, T3, T5, A3, A4, A5, plus an extra one posterior lateral to A5. Sternum longer than wide.

Legs (Figs 2D–E, 6F) 1243. Measurements: see Table 1. Legs pale brown with dark brown bands on distal femur, patella, tibia and metatarsus. Leg spines: 1: femur: D0–1–1, P0–1–0; 2: femur: D0–1–0; 3: femur: D0–1–1; patella: D0–0–1, tibia: D1–1–0; 4: femur: D0–1–1, patella: D0–0–1, P0–1–0, tibia: D1–1–0. Tarsal claws with approximately 5 teeth on claws of legs 1 and 2 and approximately 3 teeth on claws of legs 3 and 4; claw tufts sparse; scopula on distal third of metatarsus and tarsus of all legs, sparse on legs 1 and 2 and well developed on legs 3 and 4. Legs 1 and 2 with tufts of very long black hair covering dark brown bands laterally and ventrally on distal $^2/_3$ of tibia and distal $^3/_4$ of metatarsus (Figs 2D, 6F); stout dorsal and ventral hairs on brown bands of tibia and metatarsus of legs 1 and 2, stout dorsal hairs on distal half of tibia and on metatarsus and tarsus of legs 3 and 4. Trichobothria: 1 and 2: dorsal proximal group of 7 on tibia, dorsal distal row of 3 on metatarsus, dorsal distal row of 3 on tarsus; 3 and 4: dorsal proximal group of 7 on tibia, dorsal distal row of 2 on metatarsus, dorsal distal row of 2 on tarsus. Tarsal organ slightly larger than base of trichobothria (Fig. 6F).

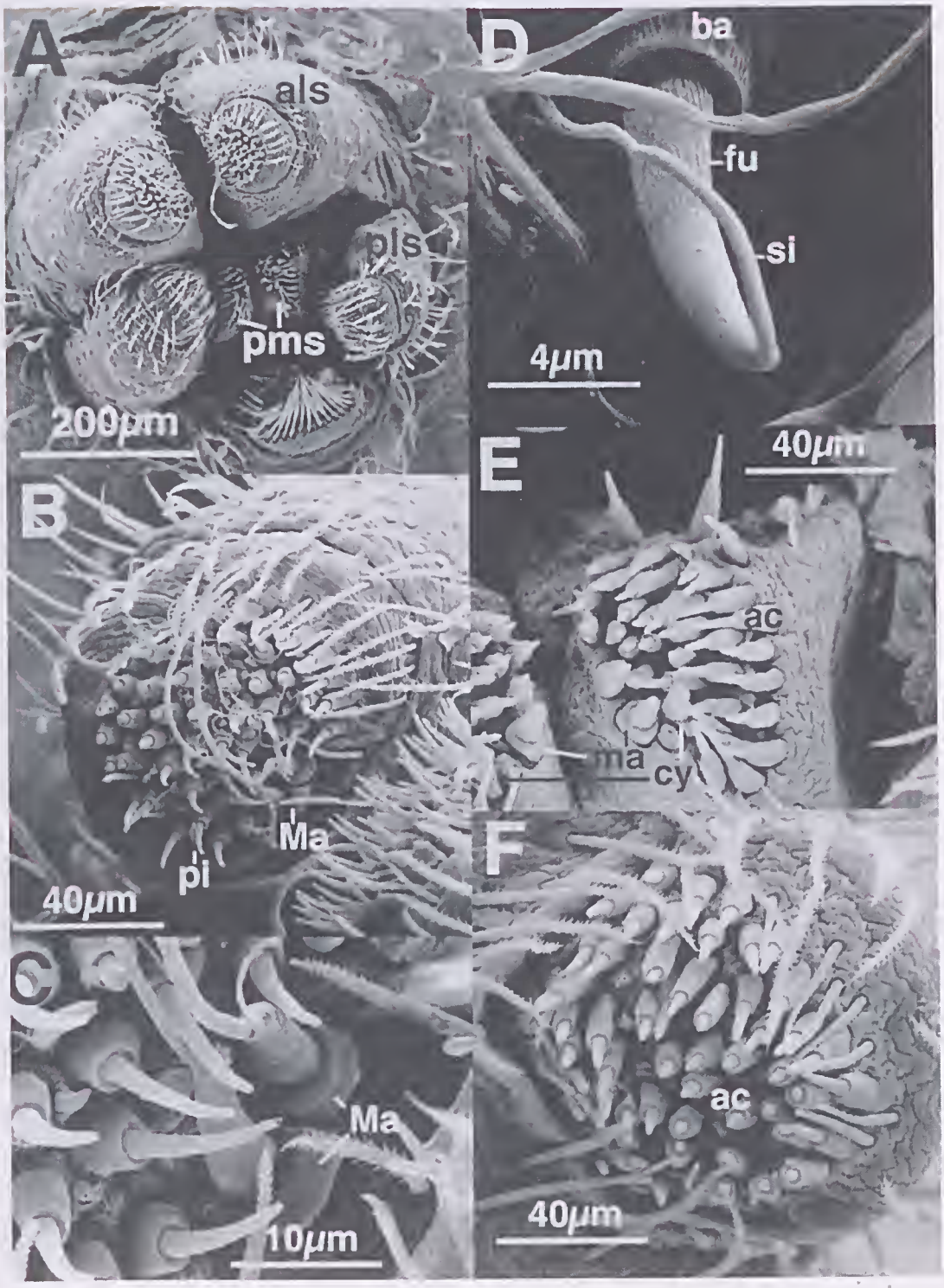
Male palp (Figs 2F–H, 6D–E): Tibia with large RTA with a well-defined dorsal tip bearing backwards-facing denticles, VTA small. Cymbium indented in the region of the retrolateral tibial apophysis. Tegulum simple, a small posterior apophysis near the proximal edge of the tegulum is revealed in the expanded palp. Embolus winding almost twice around the tegulum, filiform and pointed.

Abdomen oval, light brown with white patches and erect setae. Spinnerets (Fig. 7): one major ampullate gland spigot and 12 piriform gland spigots on ALS (Fig. 7B), one minor ampullate gland spigot and 5 aciniform gland spigots on PMS (Fig. 7C), approximately 13 aciniform gland spigots on PLS (Fig. 7D).

Remarks

Females varied in size: CL 2.0–3.0, CW 2.2–3.1, AL 3.2–4.6, AW 3.2–4.7. The shape of the abdomen also varied: being variously AL > AW, AL = AW and AL < AW. It is possible that the proportions change during egg laying. The number of teeth on the tarsal claws varied: the posterior claw had more teeth than the anterior claw on the each leg and the claws on legs 1 and 2 had more teeth than the claws on legs 3 and 4. The number of trichobothria in the prolateral group on the tibia

Fig. 5. Diasterea lactea, female, spinnerets. A, spinning field. B–D, ALS. B, right ALS. C, major ampullate gland spinnerets with silk. D, piriform gland spinneret with silk. E, left PMS. F, left PLS. ae = aciniform gland spigot, als = anterior lateral spinneret, ba = base of spigot, cy = cylindrical gland spigot, fu = fusule of spigot, Ma = major ampullate gland spigot, ma = minor ampullate gland spigot, pi = piriform gland spigot, pls = posterior lateral spinneret, pms = posterior median spinneret, si = silk.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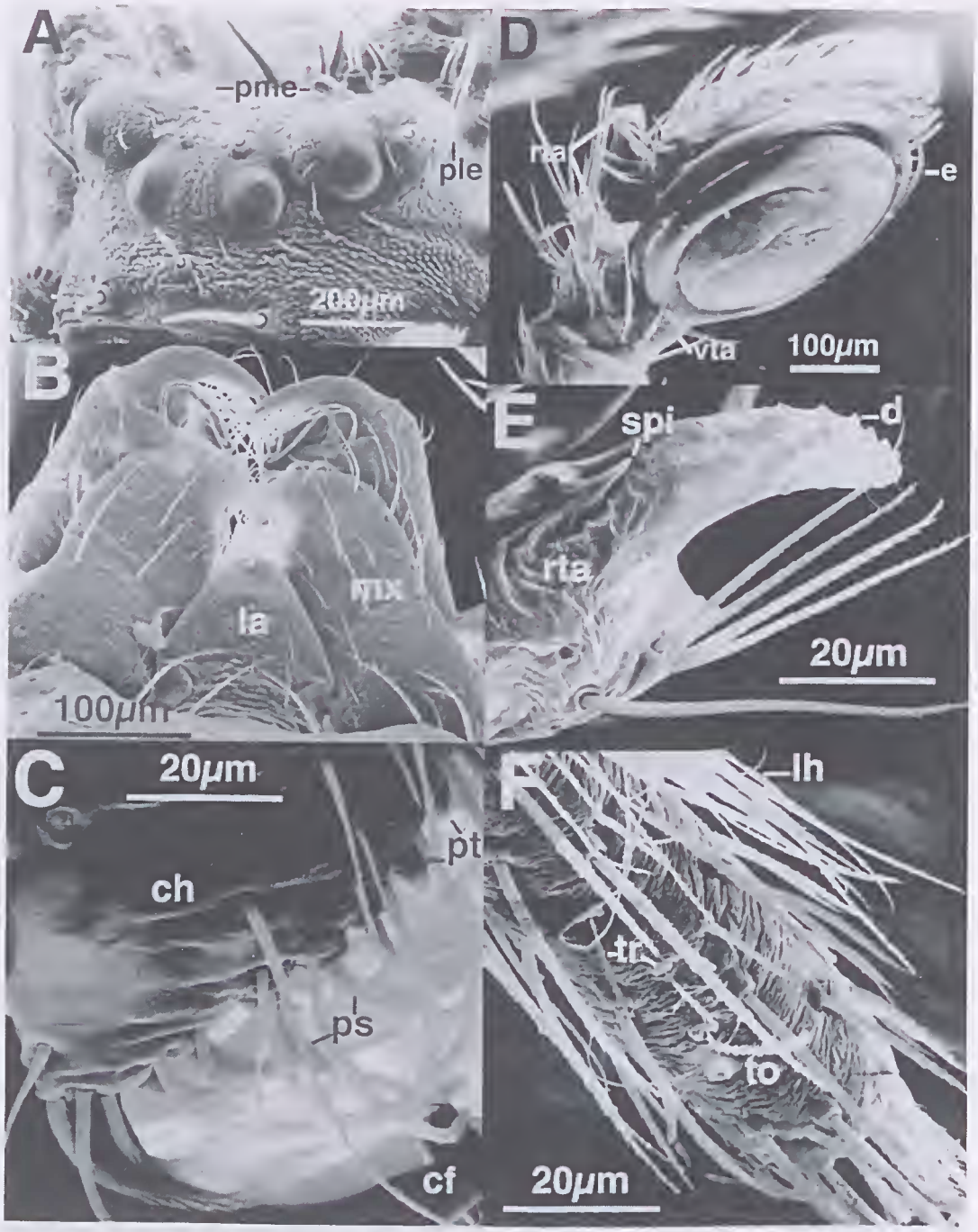

Fig. 6. Diasterea lactea, male. A, carapace, anterior. B, mouthparts, ventral. C, right chelicra, anterior. D–E, right palp: D, posterioventral; E, RTA. F, tarsus 4 with tarsal organ and base of distal trichobothrium. cf = cheliceral fang, ch = chelicera, d = denticles, e = embolus, lh = lateral long metatarsal hairs, la = labium, mx = maxilla, pme = posterior median eye, ple = posterior lateral eye, ps = promarginal cheliceral seta, pt = promarginal cheliceral tooth, rta = retrolateral tibial apophysis, spi = spine, to = tarsal organ, tr = trichobothrium, vta = ventral tibial apophysis.

varied considerably. Color markings varied. The white markings on the carapace were similar in all specimens, but the pair of dark brown longitudinal stripes on the cephalothorax were reduced to a pair of spots in some and were entirely absent in others. Leg markings on 1 and 2 varied from broad almost black bands on the femur, patella and tibia, a dark spot on the femur and patella and a narrow dark brown band on tibia to lesser markings or none. Abdominal markings varied from well defined orange-brown patches over the entire surface, pale patches over the entire surface, a few anterior patches which may or may not be contiguous to none. The combination of cephalothorax, leg and abdominal markings appeared to be at random. The position of the two pits near the mid-posterior margin of the epigyne varied slightly.

Examination of the *Misumena lactea* holotype and *Misumena albiceris* specimen from ZIMH confirmed that the both specimens belong to the same species. The vial containing the *M. albiceris* specimen contained the words 'Peak Downs' on a

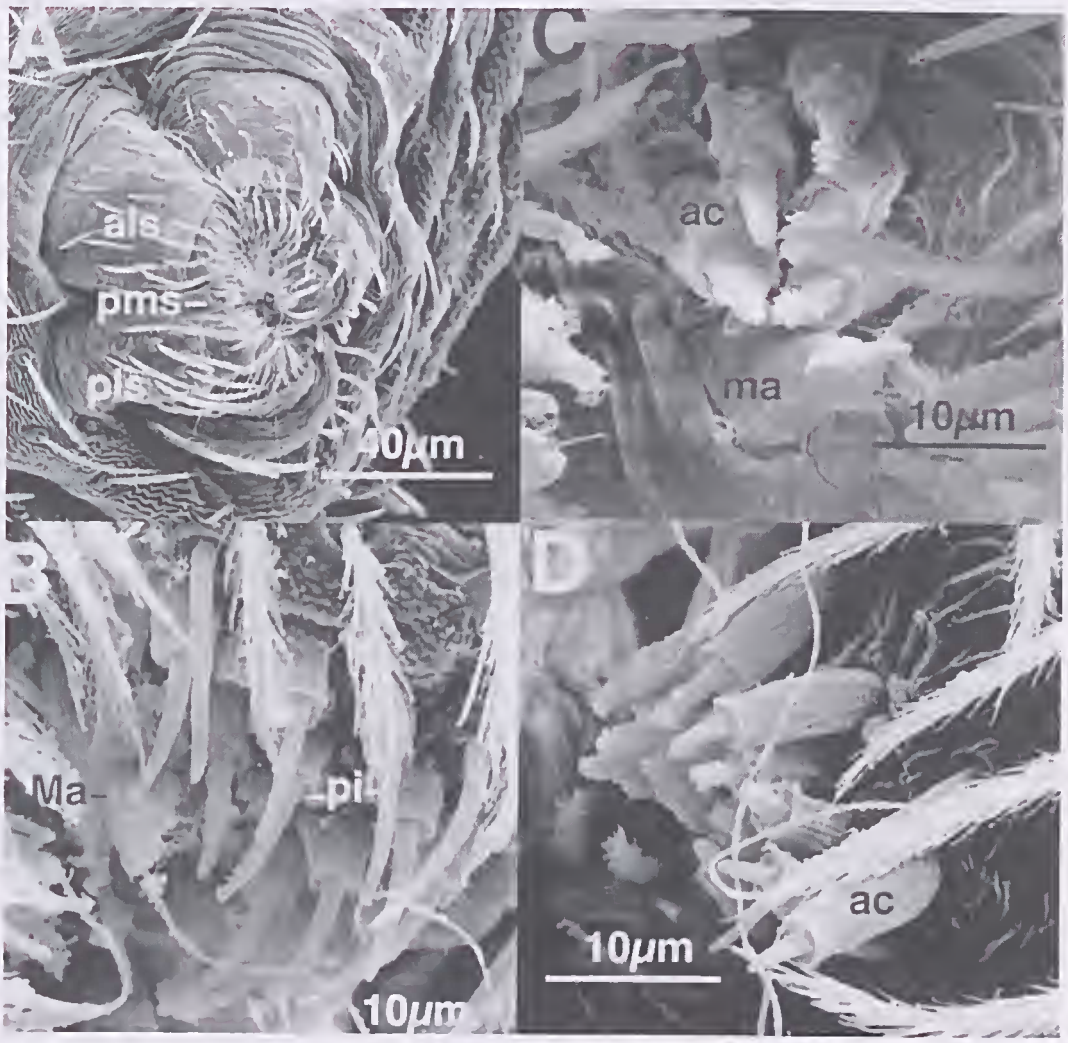

Fig. 7. Diasterea lactea, male, spinnerets. A, spinning field. B, left ALS. C, left PMS. D, PMS. ac = aciniform gland spigot, als = anterior lateral spinneret, Maa = major ampullate gland spigot, ma = minor ampullate gland spigot, pi = piriform gland spigot, pls = posterior lateral spinneret, pms = posterior median spinneret.

small label in the inner vial with the specimen. The color pattern on this specimen was the same as Koch's (1876) illustration, therefore I believe that this specimen is in fact the holotype which has been mislabelled. The measurements of the types were within the range given above. The differenees in the epigynes depicted by L. Koch was due to the fact that *Misumena lactea* has a swollen abdomen, whereas *Misumena albiceris* has a collapsed abdomen, presumably having already laid her eggs before being preserved. *M. laetea* has no brown pigmentation, *M. albiceris* has a pair of brown longitudinal stripes on the cephalothorax, five small brown patches on the abdomen and a network of pigmentation anteriorly on the abdomen.

Biology

Females and males were collected from daisies *Braeteantha braeteata*, *Chrysocephalum semipapposum*, *C. apiculatum*, *Braehyscome multifida* and *Braeteantha viseosa–braeteata* hybrid. Females were also observed on *Clematis aristata*, and with egg sacs on *Eremophila eriocalyx* and *Anigozanthos* hybrid. The female on *Braehyseome multifida* was the only spider collected on this species, despite diligent searching, and may have been searching for a suitable place for its egg sac as it built one soon after in captivity. Males were collected from *Rhodanthe anthemoides*, *Olearia tomentosa* and *Ixiolena*.

Females had the ability to vary in color in life, from white to varying shades of yellow. The yellow ones were found only on the *Chrysocephalum* flowers which were yellow, but white spiders were also found on these flowers. The yellow spiders lost most of their color in captivity, and all of it when preserved.

Male and female QM S30577 which were collected together, were observed mating. The male was photographed on his own on a daisy flower (Fig. 3A). When the female was placed on the daisy, the male ran straight to her and mounted her (Fig. 3B–C), and attached himself to her upside down, with his head towards her anterior, suspended ventral side up by legs 1 and 2 placed around her waist (Fig. 3B), presumably while inseminating her with his palps.

From the collecting data it can be concluded that adults are present from early November to late February.

DISCUSSION

Diasterea lactea does not fulfil the diagnosis for *Diaea* given by Ono (1988: 156) and Schick (1965: 103), nor *Misumenops* given by Schick (1965: 108). *Diasterea* is similar to *Misumenops* in that the male is much smaller than the female, the lateral eye tubercles are combined, the abdomen is pyriform, and the female genital ducts are similar. *Diasterea* is similar to *Diaea* in that the claws of legs 1 and 2 have 7–10 teeth and there is no spermathecal organ. *Diasterea* differs from both in the chaetotaxy (seta A1 is absent) and the two promarginal chelicecal teeth.

Diasterea lactea differs from the Australian species *Diaea eruentata*, *Diaea pilula* and *Diaea inornata* because in the latter, the lateral eyes have distinct relatively small eye tubercles and the males are only slightly smaller than the females. These species have similar male palps and similar arrangements of female ducts to *Diasterea lactea* (see Dondale 1966). This supports the view of Lehtinen (1993) that at least some Australian–Polynesian '*Diaea*' deserve generic status.

The ability of *Diasterea lactea* to change color is in common with a number of other thomisids, and appears to be an adaptation allowing the spider to blend with a colored flower on which it awaits its prey.

The male *D. lactea* did not tie the female down with silk as reported by Clyne (1979) for a '*Diaea*' species from Sydney. Forster & Forster (1973) also show immobilisation of the female of the green New Zealand *Diaea*. In this species, the male approaches from above and from the side, crossing from one side to another a number of times before completing mating. The male of *Misumenops asperatus* also approaches from the side (Gerschi 1939). Gertsch (1939) did not describe the male tying down the female with silk. Instead, the female found a vertical surface and attached to it abdomen up before mating occurred. Huber (1995) studied the mating of *Misumenops tricuspidatus* in which the RTA is inserted into a median hood of the epigyne. As there is no hood in *D. lactea* and the female epigyne bears usually two pits the position of which is variable, it is possible that the denticulate dorsal tip of the RTA may anchor the male palp into the integument of the epigyne during copulation. The mating behaviour may be another character which separates *Diasterea* from *Diaea* and *Misumenops*.

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